CANADIAN GEOGRAPHICAL JOURNAL

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W. V. Crich

WILLOWS BESIDE THE MILL-POND AT OWEN SOUND, ONTARIO

THE CANADIAN GEOGRAPHICAL SOCIETY

OTTAWA, CANADA

The Society's ambition is to make itself a real force in advancing geographical knowledge, and in disseminating information on the geography, resources and people of Canada. In short, its aim is to make Canada better known to Canadians and to the rest of the world.

As one of its major activities in carrying out its purpose, the Society publishes a monthly magazine the Canadian Geographical Journal, which is devoted to every phase of geography—historical, physical and economic—of Canada, of the British Commonwealth and of the other parts of the world in which Canada has special interest. It is the intention to publish articles in this magazine that will be popular in character, easily read, well illustrated and educational to the young, as well as informative to the adult.

The Canadian Geographical Journal will be sent to each member of the Society in good standing. Membership in the Society is open to any one interested in geographical matters. The annual fee for membership is four dollars (Canadian currency).

The Society has no political or other sectional associations, and is responsible only to its members. All money received is used in producing the Canadian Geographical Journal and in carrying on such other activities for the advancement of geographical knowledge as funds of the Society may permit.

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This magazine is dedicated to the interpretation, in authentic and popular form, with extensive illustrations, of geography in its widest sense, first of Canada, then of the rest of the British Commonwealth and other parts of the world in which Canada has special interest.

The articles in this Journal are indexed in the *Canadian Periodical Index* which may be found in any public library.

The British standard of spelling is adopted substantially as used by the Dominion Government and taught in most Canadian schools, the precise authority being the Oxford Dictionary as edited in 1936.

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Photograph by W. V. Crich

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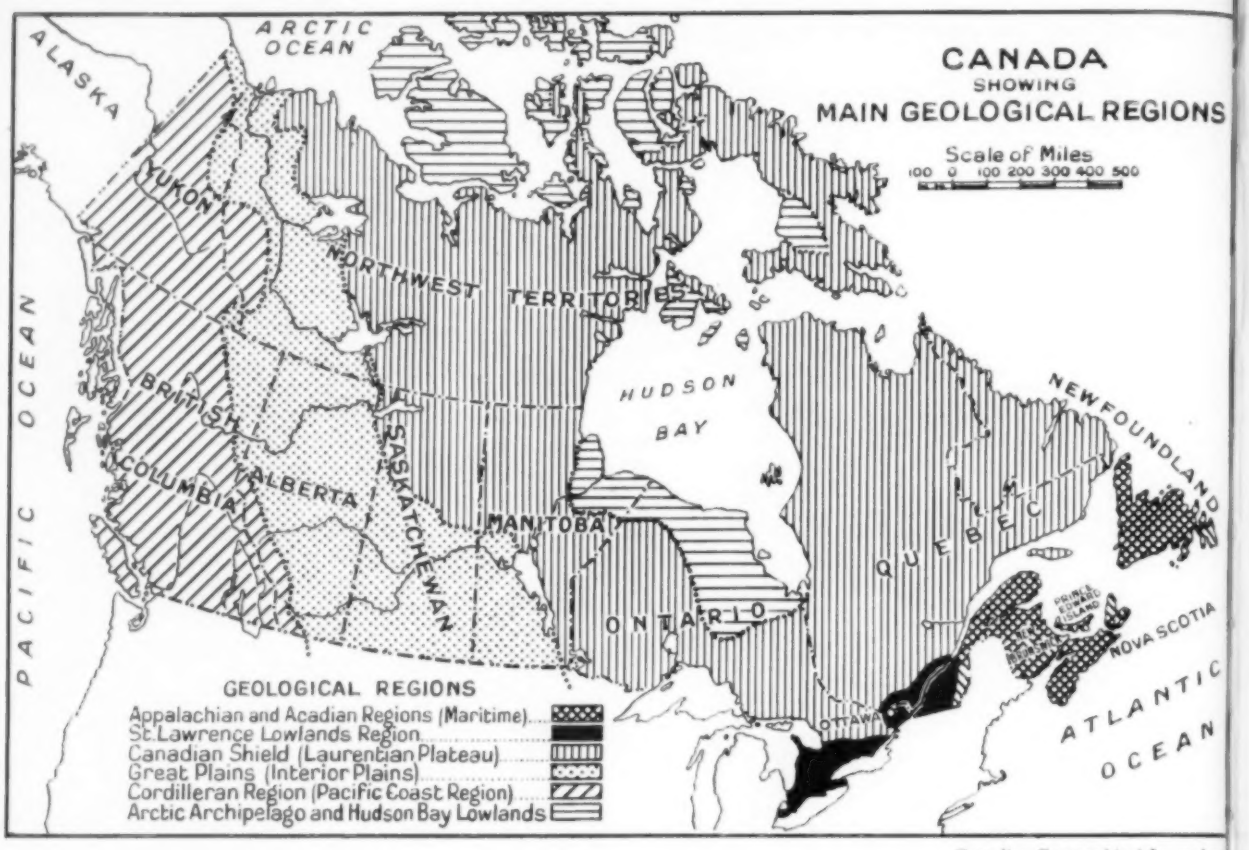


Canadian Geographical Journal ma

Wealth From The Canadian Shield

by B. J. McGUIRE *and* H. E. FREEMAN

Conquest of the Canadian Shield

ONE of the most significant achievements of the Canadian people in the past half century has been the gradual but effective conquest of a thousand mile barrier of rock, bush, muskeg and water—the southern part of the Canadian Shield.

For centuries this vast wedge-shaped shield, driving down against the shores of the Upper Great Lakes, stood as a wall between the East and the West, denying to Canada the strength, vigour and development which comes from geographical and political unity. Yet, within the past fifty years this land has been subdued; what was once a dividing chasm of waste land has become a connecting link of great value, uniting the East and the West, contributing to the wealth and development of both.

While many factors have contributed to the meteoric rise of Canada as a strong and wealthy country among the nations of the world, it is a fact that without the conquest of this barrier, without the wealth it now produces, Canada could never have become the great country she is today. The accelerated development of Canada results, in part, from the change in the role of the Canadian Shield from a handicap to an asset to our national life.

What, then, is this Canadian Shield? It is sometimes called the Laurentian Upland or the Precambrian Shield, and it is the largest of six geological areas into which Canada is divided. It is one of the oldest rock formations in the world, modified in appearance by a mighty glacial movement thousands of years ago. Although it is generally rocky, its rocks seldom rise more than 500 feet. Much of it is covered by muskeg, bush and lakes. West and south of it lie the Great or Western Plains (Interior

Plains) which we know as the prairies, and farther west the Cordilleran Region which includes the Rockies, the foothills, the Pacific Coast and the adjoining islands. East and south of the Shield lie the St. Lawrence Lowland Region which includes Southern Ontario and the valley of the St. Lawrence, and the Appalachian and Acadian Regions which take in Gaspé and the Maritime Provinces in Eastern Canada. To the north is the Arctic Archipelago and Hudson Bay Lowland.

In actual size, however, the Canadian Shield, which stretches far into the Arctic, is much bigger than any of the other five regions and makes up more than half the total area of Canada. It reaches from the delta of the Mackenzie River in the Arctic, south and east to Lake of the Woods near the Ontario-Manitoba border. It crowds the north shore of Lake Superior, covers the northern sections of Lake Huron and Georgian Bay, then runs almost in a direct line to Ottawa and Quebec City. From there it follows the shore line of the St. Lawrence to Labrador and the Atlantic coast. Until the present century the Canadian Shield acted as a mighty reef against which most of the tide of immigration broke and turned southwards or retreated eastwards. Settlers could proceed up the St. Lawrence, across Southern Ontario, but the route from there to the prairies was strenuous indeed. It entailed a trip through the Great Lakes—which could be navigated only in summer—then 500 miles by canoe, portage and horse to the Red River Valley where the Great Plains began. How many settlers turned southwards to the United States because of this barrier may never be known, but it is an obvious fact that had the Shield not existed and had settlers been free to travel straight west to the Rockies—as they were in the United States—the settlement of Canada would have been vastly different.

The difficulties of travel through the part of the Shield stretching over Northern Ontario were not solved until the coming of the transcontinental railway. Even today there is an authentic record of only a few automobiles crossing under their own power from Eastern Canada through this region to the prairies. All that will be changed in a few years, but in most of this great stretch of land the plane and railway are still the only alternatives to travel by canoe and dog sled.

Much of this vast region remains undeveloped, but that section lying immediately north of the Great Lakes and St. Lawrence has been at least partially conquered.

All forms of transportation are used on the Canadian Shield. Here, a diesel tug is towing scows of supplies to remote mining areas.

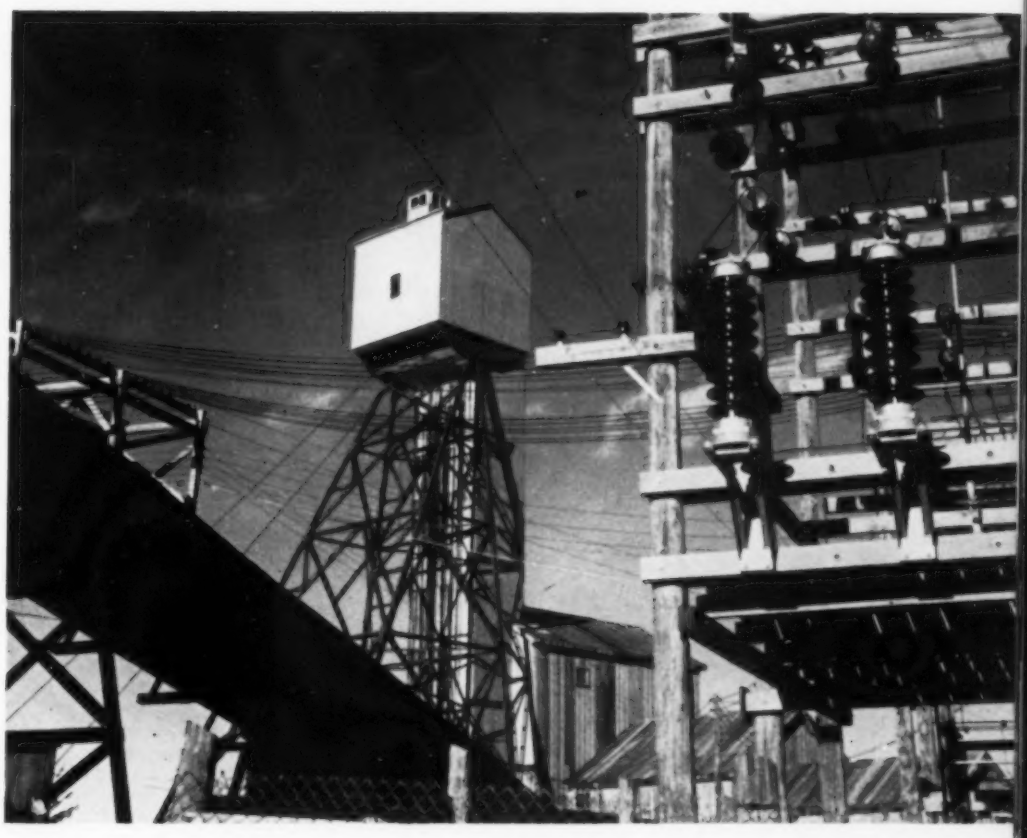
Canadian Metal Mining Assoc.

Logging operations, large and small, dot the Canadian Shield. At Lac St. Joseph, 100 miles north of Sioux Lookout, Indians line up the last of a summer's cutting of wood for use at one of the mines.

A farmer ploughs his fields in northwestern Quebec, the twin stacks of the Noranda smelter in the background.

The transformation of the Shield from obstacle to asset did not come about quickly nor by accident. It occurred because Canadians sought some useful purpose it could serve and found it in the natural resources which, when developed and marketed, contributed so greatly to the growth and wealth of the Dominion.

Today, the bushland of the Shield provides a great deal of Canada's pulpwood and lumber; the rivers and lakes provide water power which has made Canada one of the most highly electrified countries in the world. Lakes, rivers and bush make it a paradise for sportsmen; certain sections of it are excellent for farming. Its rocks contain no oil or coal but comprise one of the world's



Mining and electricity go hand-in-hand. This power line transports electricity from the new Rat Portage development north of Sioux Lookout to the Pickle Crow Gold Mines.

Canadian Metal Mining Assoc. photographs

greatest treasure houses of other useful and valuable minerals.

This is chiefly a story about mining in the Canadian Shield. The story confines itself to mining for the simple reason that no one story could do justice to the contribution of the miner, the railroad man, the lumberjack and the engineer to the development of the Shield that helped to make Canada great. But it should be remembered that the history of the area—as well as the interdependence of industries in the modern world—makes it necessary and desirable for the prospector and miner to share with the woodsman, the fur trapper, the farmer, the construction worker and the merchant much of the credit for the valuable development which has occurred in at least one part of the Canadian Shield. Without the work of all, this desolate and forbidding wasteland could not easily have been changed into a region sprinkled with the bright lights of dozens of snug, progressive and wealth-producing communities.

Despite the very rapid development of this great region, the Shield does not yield its riches easily. Mining there, like mining anywhere else in Canada, is still a job of dogged perseverance, hard work and frequent disappointment. Even in the world's richest mineral land, mining offers few royal roads to riches.

In this respect, of course, the development of Canada's mineral resources is no different from the development of other great resources of this Dominion. The people of any country must make use of the resources of their country before those resources can be made valuable. Since time began, Canada has possessed tremendous natural resources in its soil, its forests, and its mineral rocks, but the resources were of little value to early inhabitants who did not know how to use them. When the first white men came

Photographs by G. M. Dallyn

ashore, they found that the Indians were poorly housed and living much of the time on the verge of starvation. The Indians lived in a fabulously rich country but they were poor because they did not understand how to develop those riches. Nor did they have the means to develop the treasure house in which they lived.

It is the development of natural resources, rather than the resources themselves, which has made Canada prosper. This is as true of our mineral wealth as it is of all the other resources with which our country has been blessed.

Mining Outside the Shield

Although this is largely a story of mining in the Canadian Shield, a development of the past half century, it is important to remember also that mining has always been closely associated with our history, and producing mines outside the Shield still play a vital part in our lives.

The coal seams of Cape Breton Island were worked first in 1720. The first coal on the continent was mined here on the north-eastern tip of Nova Scotia which juts out into the Atlantic Ocean, and from these seams, many extending four and five miles out under the sea, the Scottish-accented miners of Cape Breton still produce an average of more than 4,000,000 tons of coal each year. Iron ore found near Three Rivers and thought to be suitable for the production of cannon, was a factor in the Seven Years War which brought Canada into the British Empire. Gold was first found in Canada in a stream flowing into the Chaudière River near Quebec City. While the iron ore on the banks of the St. Maurice was produced only in small amounts and the gold in the Chaudière never led to mining operations. Cape Breton coal continues to be very important to Canada as well as to the island where it is the chief industry.

Centre:—From Glace Bay comes much of the coal used at Sydney. View of mining community where mines extend miles under the ocean.

Bottom:—A close-up of a representative coal mining plant within a few miles of Sydney. A budding miner in the foreground interviews the photographer.

Left:—Panoramic view of Sydney Steel Plant at Sydney, Nova Scotia, where great quantities of Cape Breton coal are used.

Aero Surveys Limited, Vancouver, B.C.

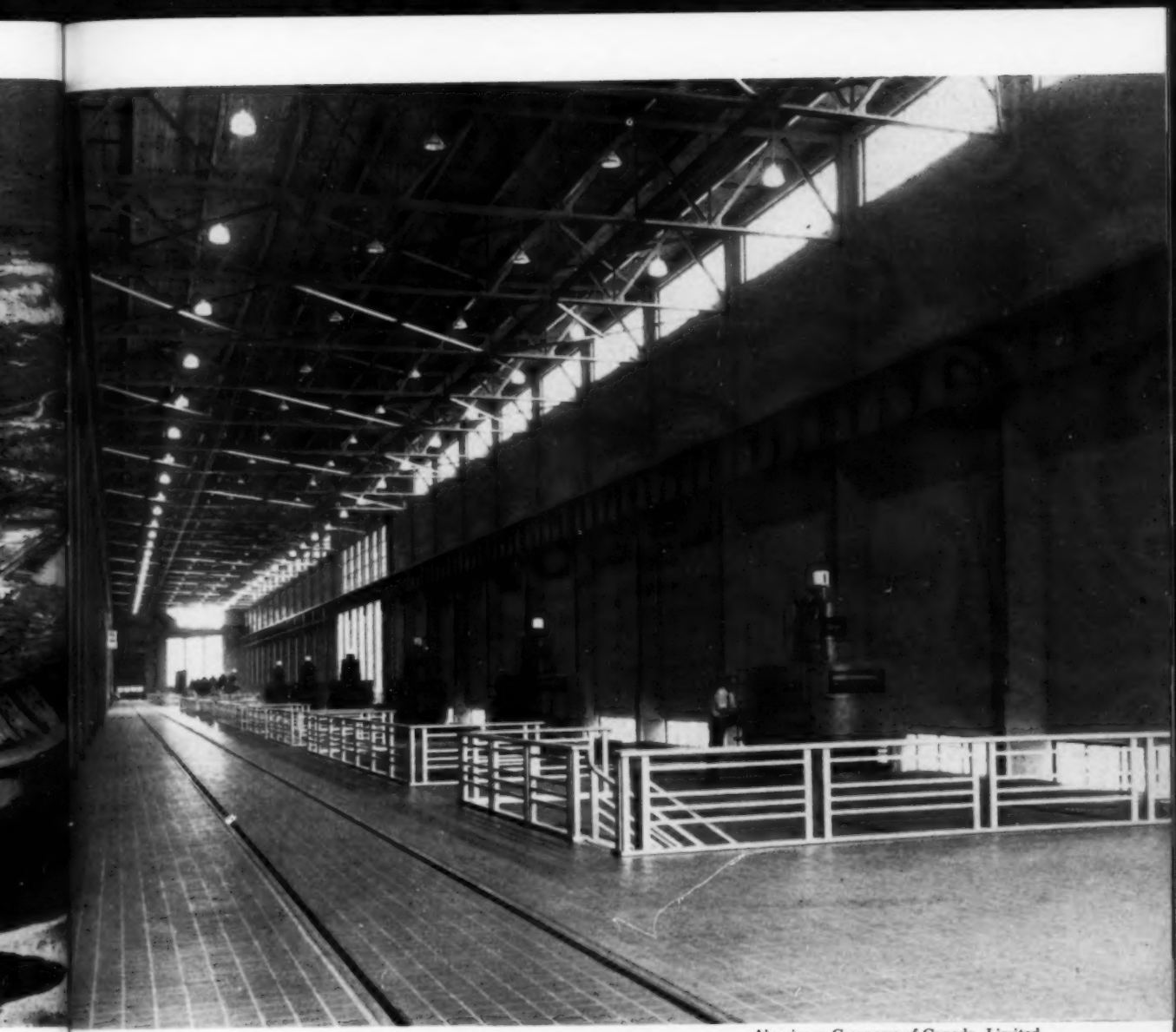
General view of gigantic smelting plant at Trail, British Columbia.

On the other side of Canada, the mighty silver-lead-zinc-smelter of Consolidated Smelters at Trail, British Columbia, is the heart of a long-established and progressive mining industry which had its roots in the famous gold rushes to the Klondike and the Cariboo districts in the early days of the development of the northwest.

Different Minerals

Despite this long association of mining with Canada, it was only about fifty years ago that it actually became a large industry in this country. In the past half century the number and importance of the mines have increased until their output is exceeded in value only by the agricultural and forest products of Canada.

Canada has become the world's greatest producer of nickel, asbestos, platinum and radium; she ranks second in the world as a producer of gold and zinc; third as a producer of copper, silver, lead and arsenic; fourth as a producer of magnesium. It is interesting to note too that Canada is the world's second greatest producer of aluminum, not because the aluminum ore itself is found in Canada, but because the turbulent rivers of the Canadian Shield produce the electricity needed to convert this ore into aluminum.



Aluminum Company of Canada, Limited

Interior view of No. 2 Shipshaw Power House

Aerial view showing part of the mining town of Flin Flon, Manitoba. On the left is the open pit of the Hudson Bay Mining and Smelting Company. This mine, largest now in operation in the province, produces great quantities of zinc and copper.

Manitoba Govt. Publicity Bureau

Group of Canadian miners representative of the thousands engaged in the industry.

Canadian Meta Mining Assoc.

The world's longest grinding aisle is in the International Nickel Company's smelter at Copper Cliff, Ontario, where ore is broken into fine pieces in whirling drums containing steel grinding rods and balls.

International Nickel Company of Canada, Limited

Importance of the Mining Industry

Such vast production of many of the earth's most essential minerals is of greatest importance to the entire civilized world. But just what does it mean to Canadians?

It means, for one thing, the steady creation of new wealth for the people of Canada because the products of our mining industry in their many forms are eagerly sought by the nations of the world. From Canada these mineral products go out to all parts of the globe and bring back a steady stream of money which in turn allows Canadians to buy in foreign markets many of the things which they do not produce themselves. In the last fifty years, Canada has produced mineral products worth more than ten billion dollars and present mining operations are adding more than three-quarters of a billion dollars to this figure each year. Every new successful mine creates new wealth for Canada and Canadians.

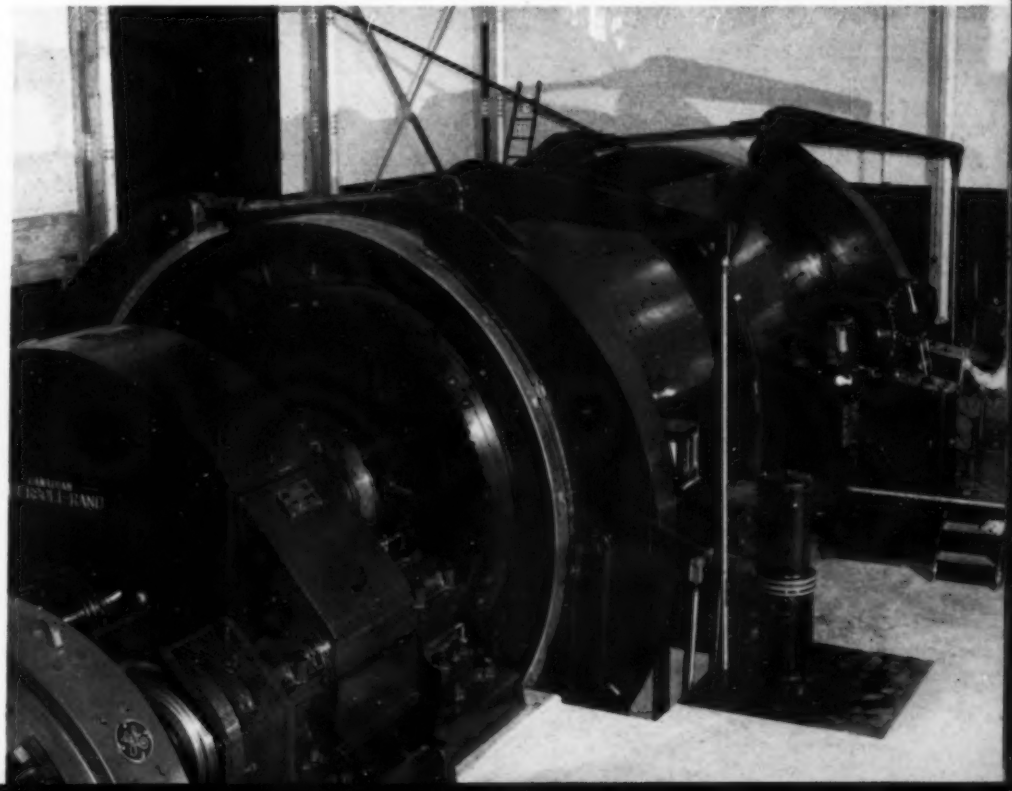
Mining is also of vast importance to Canada in terms of the people employed. At the present time, some 112,000 men are working in mineral industries from coast to coast in Canada. As these men are the

"bread-winners" of their families, it will be seen that, counting the miners' families, possibly 500,000 people are supported directly by mining in this country. Canada's mining communities may seem to bear little relation to the prosperity of eastern or western farmers until it is realized that these centres buy more than $65,000,000 worth of food each year from Canadian farmers. Mining communities annually buy more than $150,000,000 worth of clothing, shelter, furniture and other articles which keep additional thousands of people working in other parts of the country. They buy more than $100,000,000 worth of miners' supplies—such as lumber, machinery, electrical equipment and hundreds of similar products.

There is still another way in which mines contribute to the growth of Canada. It is illustrated by the manner in which the frontiers are being continuously pushed back as the settlements move steadily ahead. Where fifty years ago there was little but bush, rock and water, we now have thriving settlements in Northern Ontario, northwestern Quebec, and northern Manitoba, as well

International Nickel Company of Canada, Limited

Some idea of the amount of timber used underground in Canadian mines can be gained from this pile outside one of the shafts of the International Nickel Company.



The new hoist at the Kerr-Addison property is the largest in Canada. Hoist operators are skilled experts who control the raising and lowering of cages full of men or materials in the mine shaft.

Canadian Metal Mining Assoc.

Miners change their clothes in huge "change rooms". At the end of the shift working clothes are hauled to the ceiling where they are dried by blasts of hot air.

as the beginnings of a new era in a once remote area, the Northwest Territories. Where once a handful of trappers and traders lived in these places and in similar areas from Cape Breton in Nova Scotia to the Klondike in the Yukon, we now have towns and cities and farm lands with a population totalling hundreds of thousands. The growth of many of these areas can be traced directly to the growth of the mining industry.

Finally, the importance of mining might be measured in terms of the contributions it makes to better living for all. While only a minority of Canadians ever actually see a mine, everyone is surrounded by things which, in the first instance, came from a mine. The stoves in our kitchens are made largely from iron which came from a mine; so is the cutlery we use on the table; the locks on our doors; the nails in our shoes; many parts of our lamps, radios, clocks, wagons, sleighs, the nibs of our pens, the salt on our table, the coal we burn—all of these things and thousands of others came from mines. It would be difficult indeed to imagine a world without minerals—it would be a world without telephones, aeroplanes, automobiles, railroads, electricity—a world without many of the things which are so useful and pleasant in everyday life.

Miners eat lunch underground wherever they happen to be working when the gong sounds.

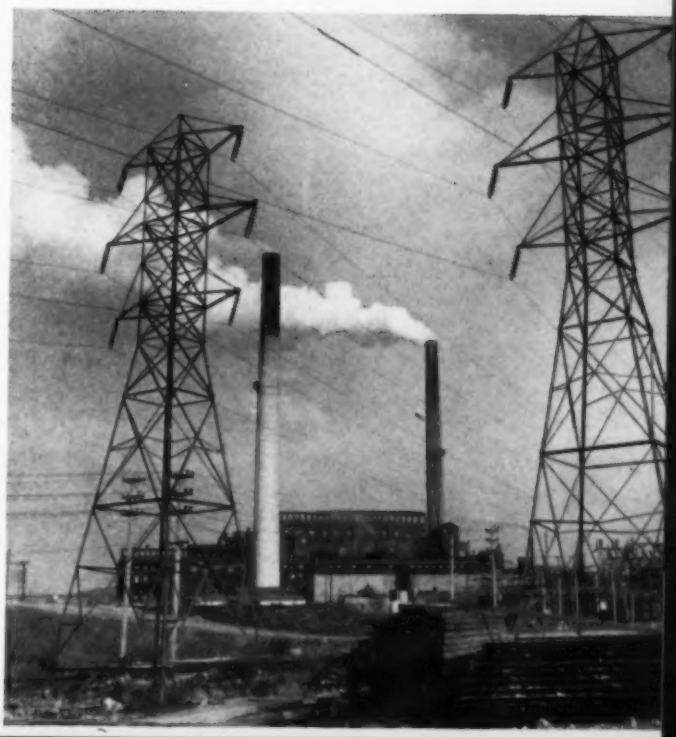
Canadian Metal Mining Assoc. photographs

Modern in every aspect is the main head-frame and mill at the Hollinger Consolidated Gold Mines, Timmins, Ontario.

Methods of Mining

Like most other working processes, mining takes on a variety of forms. Mining methods in Canada depend on such things as the richness of the ore deposit, its location and extent, the character of the mineral, and the nature of the rocks or soil. In general, there are two main methods—surface development and underground development.

Surface development may mean quarries, pits, open cuts, or placers. One of the most spectacular of surface developments in recent



Dominating the Noranda-Rouyn district in Quebec stand the twin stacks of the Noranda smelter, where copper is the major output.

International Nickel Company of Canada, Limited

Triple stacks of the Inco smelter at Copper Cliff, Ontario, send smoke plumes from the tallest stacks in the British Empire.

years is located at Steep Rock, an iron mine not far from the head of Lake Superior. Here a complete lake of 120,000,000,000 gallons of water was pumped out to expose the high grade iron ore which had remained concealed beneath its surface for centuries. More widely known, perhaps, are the placer mines (deposits in the beds of streams) of the Klondike where surface dredges are among the principal items of equipment. Part of the rich nickel deposits of the Sudbury district are mined by large mechanical shovels operating in great open quarries. The asbestos from mines in the southern part of Quebec—which produce more than three-quarters of the world's entire supply—is dug in part by a surface operation.

In the Canadian Shield, however, underground mining is the usual practice. In general, mineral deposits found underground may be divided into two broad classifications: beds or seams such as are found in iron, coal and salt mines, laid out more or less horizontally and parallel to the stratification of the surrounding rocks; and mineral veins or lodes, fissures which are filled with ore-

The open pit at Frood-Stobie in the Sudbury district is a mile and a quarter long and 350 feet deep. Giant diesels loaded by seven electric shovels carry nickel-copper ore up the winding roads.

C.P. Airlines photograph for Asbestos Corp. Ltd.

Vimy Ridge Asbestos Mine, Coleraine, Quebec

bearing rocks, characteristic of the vast majority of mines in the Shield. In this form of mining shafts are sunk, hoists are installed, underground railways are built. Into the mines go giant pumps, coils of wire, cages that can be lowered and raised rapidly, compressors to keep the ever-constant supply of air going into the ventilation system and to the drills, timbering to shore up the sections being mined, together with huge supplies of other things. In the aggregate, these add up to $100,000,000 worth of equipment and supplies which people in various parts of Canada manufacture and sell to the mines each year.

A →

C ↓

B ↘

Steep Rock iron mines, Ontario. (A):—Commencement of the pumping out of Steep Rock Lake in December 1943; six steel barges, each carrying fourteen pumps, ready to start pumping. (B):—Trucks dumping iron ore on to the stock pile that feeds the crusher. (C):—Open pit mining in 1948.

Steep Rock Iron Mines Ltd.

2.

Discovering the Minerals

In the normal order of events the geologist and the prospector are the trail blazers in the mining world. Since minerals are usually encountered under certain geological conditions, it is the purpose of the geologist—usually sponsored by the government or by some large mining corporation—to locate the areas in which the conditions are most favourable for the presence of the various minerals. These men are, in effect, the map-makers for the mining industry, although their maps do not show highways but lonely bush trails which can be followed only with considerable effort.

The great glacial movement mentioned earlier, is often the ally of the geologist and the prospector in search for minerals. The vast quantities of ice, moving slowly with irresistible force, wore away much of the Laurentian rock, leaving evidence of the minerals exposed to the keen searching eyes of the trained men who were to come along centuries later. The ability to detect these often faint signs and to read them accurately, or to trace a mineral bearing boulder to the rock formation from which it was torn and carried by moving ice, is vitally important to those who look for mines in the Shield.

Finding minerals in sufficient quantity to make a mine is the job of the prospector. Occasionally the prospector turns the key which opens nature's storehouse of vast wealth but far more frequently he spends his entire life seeking for something he cannot find.

Not so long ago the prospector travelled alone packing his supplies on his back or by mule over trackless wastes, a pick his main item of equipment. The modern-style prospector travels by plane and has a host of new techniques and instruments and a home

3.

4.

PROSPECTORS AT WORK

1. *Washing for colours*
2. *On the search for minerals*
3. *Drilling for surface blasting*
4. *Trenching*
5. *Corner posts of claims*
6. *Prospectors and their mascot*

5.

6.

office to help him. Now the prospector is often a university graduate. He probably is engaged by a large exploration company which in turn may be backed by a big mining company. He is paid a salary and assigned to a certain area. If he strikes rich deposits they belong to those who employ him but he will probably receive a percentage of the earnings of the new mine and a bonus for his find. Even this modern prospector, however, with ample financial resources behind him and the most advanced of scientific instruments at his disposal, still may spend his life without ever finding deposits of sufficient value to become a mine.

The Mine

Let us assume that our modern prospector finds on the Canadian Shield what he believes to be a prospective mine. What happens then ? The prospector's first step is to "stake out his claim" and then to register it with the government so that he, or his financial backer, has for a limited time the exclusive right to prove what may or may not be under the surface of the ground chosen.

Next comes the surface development. Trenches are dug to outline ore bodies if

Above left: The head-frame is the symbol of Canadian mining. Through it miners go down the shaft in elevators known as cages.

Great distances and lack of other transportation make flying essential in the north. This scene at Pickle Lake airport shows the daily plane arriving with freight and perishables.

Canadian Metal Mining Assoc

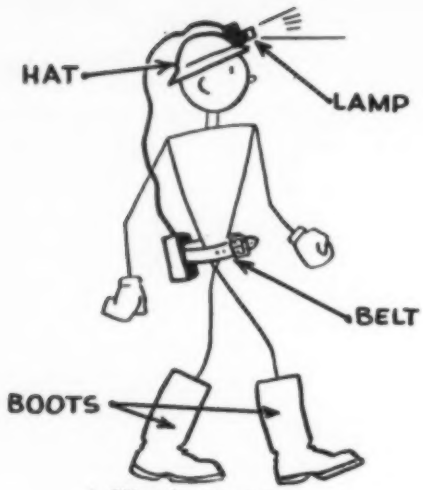
they are close to the surface. Diamond drills are used to probe the depth and shape of the ore-bearing rocks far down in the ground. The diamond drills bring to the surface round "cores" of everything they pass through below ground, and examination and analysis of these cores gives some indication of what is underneath. But ore bodies are erratic things and often assume weird shapes. They may be tremendously rich in one spot and then break off sharply into worthless rock. A few drillings are useless. Literally miles of diamond drill core must be brought to the surface and analyzed before any accurate estimate can be obtained of just what is down below and whether it is worth spending large sums of money and a great deal of time to bring out. Even with all this effort the mining men still cannot be absolutely sure of what they are going to find beneath the surface until they get down there and see for themselves. This is illustrated by the fact that out of every hundred properties which indicate good values on the basis of diamond drilling, only one ever goes through all the succeeding stages to become a producing mine.*

Once again, let us assume that in this case a property has been found which is worth developing. There is still much to be done. Engineers draw plans to decide where the mine shaft—a vertical tunnel into the ground —will be sunk. Men are hired and taken into the new territory; contractors build the head frame which straddles the shaft and houses the shaft machinery. Arrangements are made to convey the ore to a mill equipped to extract the metal from the ore, or a mill is built on the spot. Electricity is brought in from the nearest power point or a generator is set up to produce electricity in or near the head frame. Millions of feet of lumber, huge quantities of heavy machinery, tons of food, home and office furnishings—all must be brought in by the best available means of transportation, be it train, truck, boat or plane. Somewhere, somehow, somebody must risk a lot of money to buy all these things in the hope that some time the money will return with interest from the sale of the products of the mine. Ordinarily it costs more than $2,000,000 to bring a mine into production.

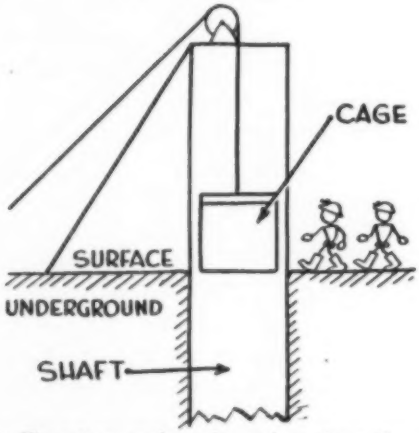
The shaft is the main artery of the mine and amounts to a complete elevator system running down far into the earth. In the case of some of Canada's deepest mines the shaft may extend as much as a mile and a half below the surface. In such cases the shaft is built in staggered sections so that there is no steady drop of any tremendous length. It is through the shaft—or in the case of large mines, through several shafts—that everything needed underground goes into the mine and everything mined comes out.

* Submission of Ontario Mining Association to Senate Committee, 1946.

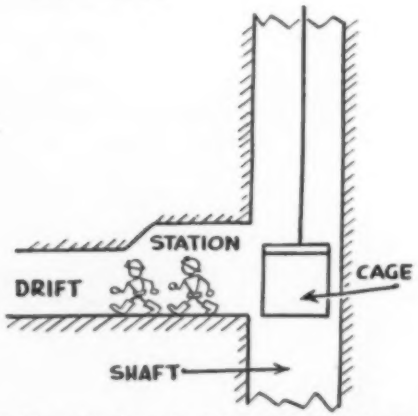
At Quemont, in Quebec, a new head-frame arises that will soon mark the advent of another producing mine on the Canadian Shield.



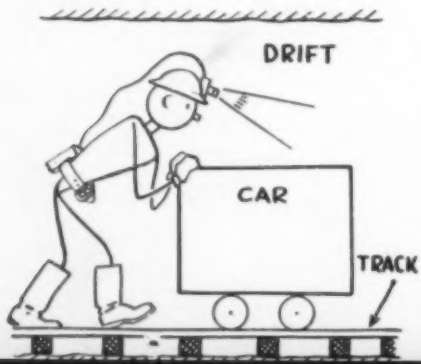
1. *What the miners wear.*



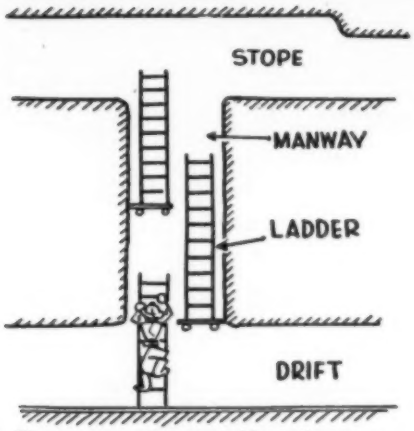
2. *The miners go from the surface down the shaft in a cage.*



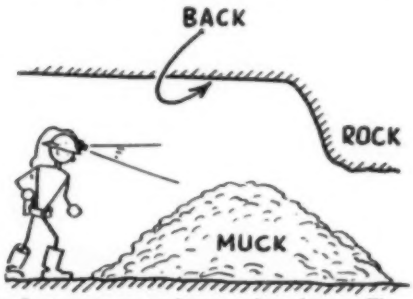
3. *The cage stops at a station underground and the men walk along an underground road called a* drift.



4. *This miner is pushing a car along the track. He is called a* trammer *and is* tramming.

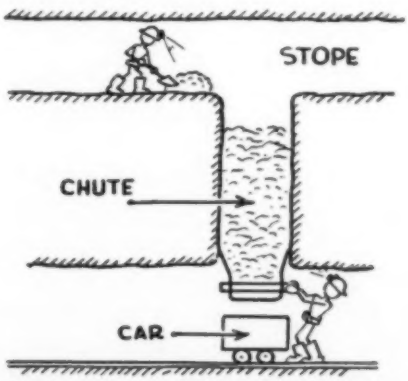


5. *This miner is going up a* ladder *in the* manway *which goes from the drift to the* stope.

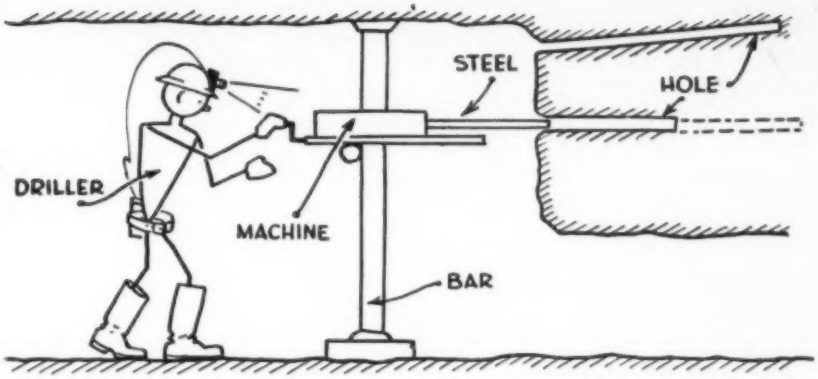


6. *A stope is an underground workroom. The roof is called back. The walls and roof are* rock; *when this is broken it is called* muck.

7. *This miner is* mucking *or shovelling muck and is called a* mucker. *He also uses a pick and a hammer.*



8. *Muckers shovel muck into a hole in the stope called a* chute, *while the trammer controls the amount of muck in his car. The trammer is* chute pulling.

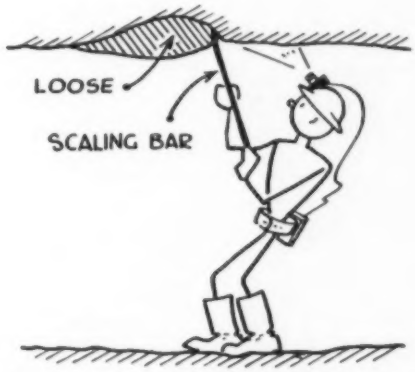


10. *Drillers cut holes in the rock with a machine held up on a bar. The machine is called a drilling machine and cutting is done with a steel.*

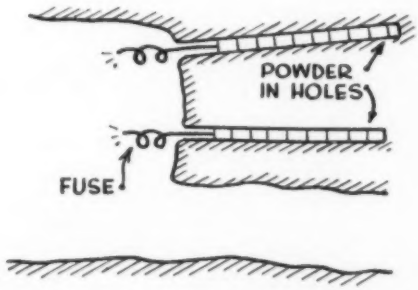
These drawings are reproduced from a booklet, in Basic English, which was produced by the Canadian Metal Mining Association. The booklets were distributed in Europe to Displaced Persons who were going to work in Canadian mines.

Sinking of the shaft is merely an essential preliminary to a great many other steps which must be taken before the ore can be brought to the surface. The illustrations show, in simplified form, the way in which the underground workings fan out from the shaft; and how the ore-bearing rock is knocked down in the stope, and shovelled down the chutes to cars waiting in the drift, along which the rock is carried to be hoisted up the shaft to the surface. It all looks very simple, but it takes many months, and sometimes years, to sink the shafts and drive the drifts and chutes to get at the ore in the stope—after which the metal must be extracted from the ore by a mill on the surface. And through the months, or years, the money is poured into development of the mine by those who have faith in its ability to pay them back later.

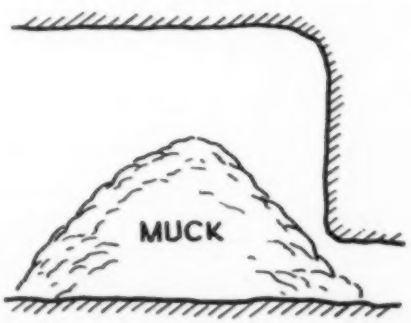
It should be remembered, too, that simplified illustrations cannot show the great number of drifts, stopes and chutes that there are in many mines. Indeed, in the big mines there are more "streets" underground than in the towns above them.

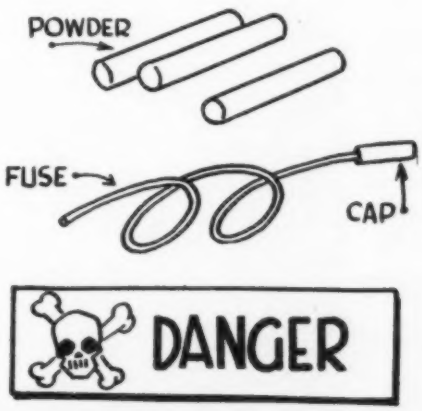


9. *This miner is taking down rock on the back that may fall—called loose. To do this he stands at the side and uses a scaling bar.*



11. *Into the holes drilled are placed* powder, explosive cap *and* fuse. *The fuse is lighted and the miners leave.*





12. *The fuse lights the cap, explodes the powder, breaks the rock into muck. The miners must not return until the smoke from the powder is gone.*

Displaced persons, now Canadian mining men, studying special safety posters, produced in four languages.

Canadian Metal Mining Assoc. photographs

Drilling is an important operation in hard rock mining. Drills like this bore holes 20 or 30 feet deep in the ore. These are filled with explosives which when detonated, break the ore to convenient sizes for shovelling.

Miners going on shift at Wright-Hargreaves at Kirkland Lake.

These streets are the main sections found in a modern mine. But the business of getting the mineral out of the ground involves much more than shafts, drifts, chutes and stopes. It requires complete and complicated ventilating systems to ensure good, clean air far underground. It involves thousands of miles of electrical wiring systems for lighting and for expensive power-operated underground machinery. It involves air and water hoses, drills, compressors, electric locomotives, fire doors, safety ladders, rest rooms, first aid stations, pumps, cafeterias—in fact most of the facilities which are found in a big city.

Most of all, it involves a constant flow of materials going into the mines on the downward trip of the elevators which bring the ore to the surface on their way up. The amount of material that has to go down a shaft to the working areas of a mine is almost as great as the amount of ore which comes up. The material going down includes thousands of tons of sand or waste rock which is used to fill up the areas where mining has been discontinued so that there is less danger of a cave-in deep in the bowels of the earth and millions of feet of lumber used to "shore up" the walls of the drifts and chutes. The quantities of material that go into the earth, never to appear again, stagger the imagination.

Another feature of life underground is the fact that the temperature remains much the same the year around. Temperature in most mines in Canada's great wedge-shaped Shield runs about 50°F.—cool enough to be pleasant in summertime and warm enough to be comfortable in winter. This reliable, comfortable temperature is a part of mining which appeals to many miners.

Two happy miners bearing the end products of the gold mining industry, small but heavy gold bricks. From the mines they are shipped to the Mint in Ottawa, the only legal buyer of newly mined gold.

Canadian Metal Mining Assoc.

Amount of Mineral in the Rock

Startling to a person unacquainted with mining is the small amount of minerals obtained in comparison with the amount of rock brought to the surface. This, of course, varies with the type of mine. Coal may come to the surface practically free of all other materials, but in the average successful gold mine *five tons* of rock must be broken, mined, hoisted to the surface, crushed and chemically treated to produce a *single ounce* of gold. The proportion of rock to metals is even higher in the case of such precious substances as platinum, palladium and far higher still in the case of radium.

The amount of metal which may occur in a ton of rock is one of the many factors which makes mining different, from the point of view of economics, from any other type of enterprise. In the final analysis, of course, the extent of valuable metal will largely determine whether the mine remains merely a prospect or becomes a valuable wealth-producing property.

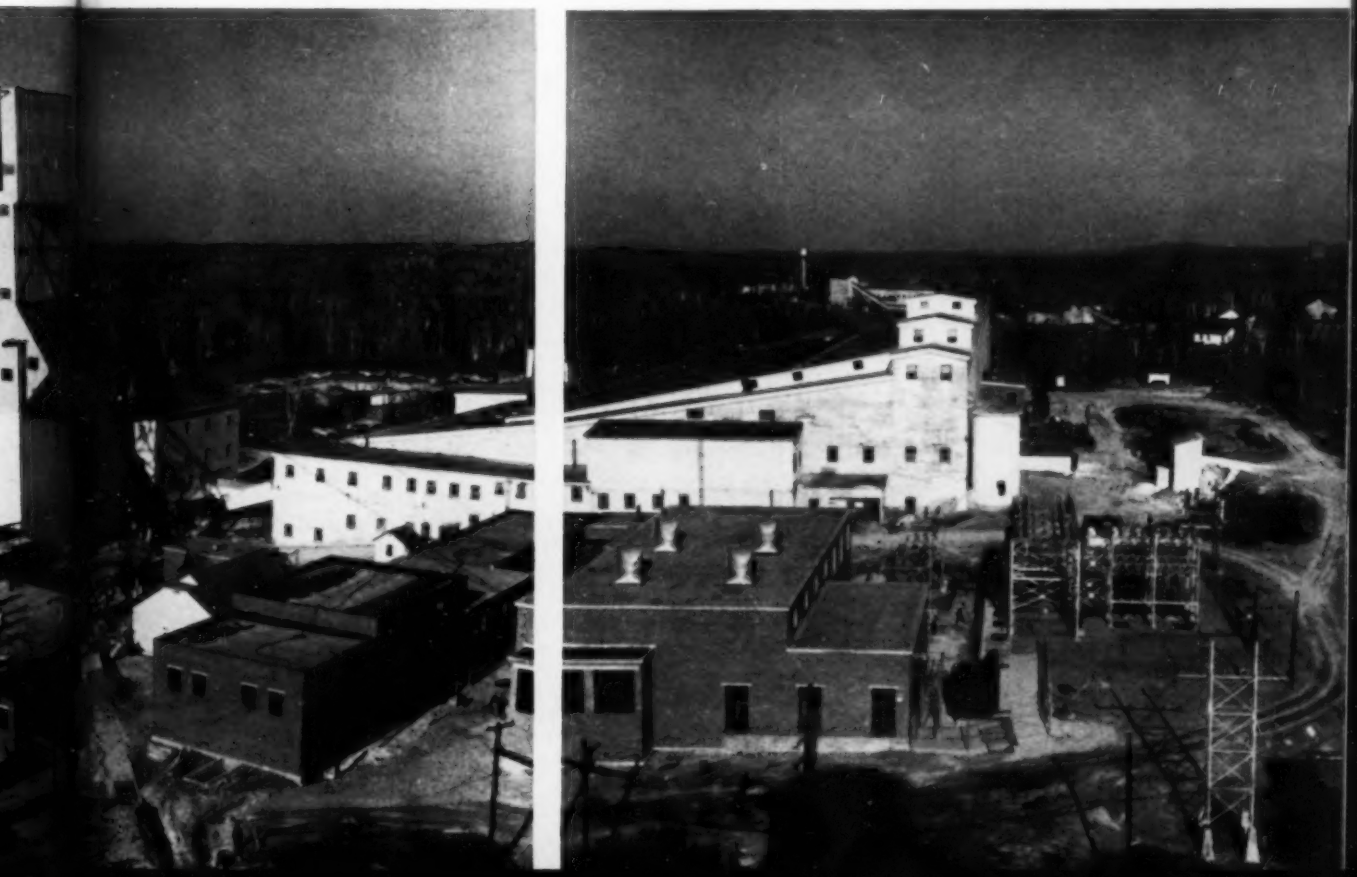
A panoramic view of a gold m[illegible] at V[illegible]

Although there are variations to the problem with every metal and every mine, an average gold mine will serve to illustrate the general situation. The controlling factor is the price of gold, which today sells for $35 an ounce. The success or failure of a mine depends on the ability of those operating the mine to meet all the expenses involved and put their gold on the market at a cost which is less than $35 an ounce. If the cost is more than that per ounce the operator is losing money and the mine is not profitable to work.

Many factors determine whether a mine is capable of meeting these costs. The location of the mine is important; if it is far away from a railroad it costs extra money to deliver the equipment and supplies necessary for operating the mine. The nature of the rock and mineral deposit is also a controlling factor in costs. Some mines may be operated and developed more easily and much less expensively than others.

Of primary importance is the amount of mineral found in a ton of rock. If there is a great deal of it—and a great deal for a gold mine would be one ounce of gold for every 24,000 ounces of rock—enough precious metal may be obtained to pay the cost of operations. If there is a little metal, say one ounce of gold for every 100,000 ounces of rock—the operation may not pay for itself. And here again the location of the mine and the selling price of the metal become important. A mine which could not afford to operate if gold were selling at $30 an ounce might operate quite profitably on today's market with gold selling at $35 an ounce; and a mine which could not afford to operate today might be quite successful if the price of gold rose to $40 an ounce. A mine which is just meeting expenses at today's prices is known as a "marginal mine". There are many of these in existence, mines which would become profitable if the price of gold went up or could not afford to operate at all if the price of gold fell or operating costs increased. These same factors largely determine the success or failure of all mines.

a gold mine at Virginiatown, Ontario.



Street scene in Rouyn, Quebec, an established mining community.

Children arriving in station-wagon from outlying points to attend school at one of the newer mining communities.

Canadian Metal Mining Assoc.

The Mining Community

When a mine is located in an uninhabited area the people who first come to work it live in camps. If the mine becomes successful the camp grows in size until it becomes a village, town or even a city. In this way began such thriving centres as Sudbury, Rouyn-Noranda, Kirkland Lake, Timmins, Cobalt, Trail, Val d'Or and hundreds of other modern communities in Canada. Such centres have paved streets, good lights, modern stores, schools, halls, hospitals, doctors, lawyers, butchers, bakers—in fact, a complete cross section of Canadian activity which provides an almost endless chain of jobs and occupations.

In spite of the rugged and often isolated nature of the country, life in a mining community is generally cheerful and pleasant. The problems arising from the extreme cold which is frequently encountered in the winter on the Canadian Shield are eliminated by dressing adequately and insulating houses properly for the cold weather. For this reason, residents of northern mining towns often enjoy the winter a great deal more than their friends in the warmer communities to the south. When people are properly dressed, the outdoor cold is not a problem. And inside their snug, warm houses the miners and their families can smile through frosted windows at the snapping cold outside.

Mining communities develop their own particular characteristics and problems. The romance and adventure of a new mining community tends to attract comparatively young people. The very nature of mining itself and the nature of the surroundings in which it is likely to be carried out appeal to young married people rather than to those who have become more set in their ways and more deeply rooted to longer-established communities. Consequently, the average growing mining community has a greater number of children than the average town or village of the same size. This means greater than ordinary expenses for education and child welfare organizations, expenses which in the final analysis are paid mostly by the mines. After a series of years of heavy school taxes, there usually comes a period of sudden boom in home-building — brought about when large numbers of children grow up together, marry and set up homes of their own at approximately the same time. The building of houses is not primarily the responsibility of the mines in an established community, but the fact remains that it does concern the mining companies since it involves the manpower needed to operate their mines efficiently.

International Nickel Company of Canada, Limited

Those who live in the north of Canada are enthusiastic about sports. Even the smallest community boasts a hockey league or bowling league, and bigger towns have community centres complete with artificial ice, bowling alleys, gymnasia, etc.

A. MacLean, Haileybury, Ontario

Scene at a street intersection of modern, revitalized Cobalt.

While the scientist of today, with his highly complex machinery, equipment and instruments, is eliminating some of the elements of luck which once lured the prospectors down the wilderness trails in hope of riches, the element of chance will never completely disappear. Nor will any scientific instrument offer a substitute for the energy and persistence which have been required to wrest these treasures from nature's vast storehouse. The history of the great mines on the Shield gives ample evidence of the need for both these factors. It was, for example, the energy of the Ontario Government in pushing a railway through to James Bay together with the luck of keen-eyed workers seeking tie-timber which first focused attention on the Cobalt district—one of the first to be opened in Northern Ontario. Legend tells us that a hatchet flung at a fox disclosed silver along the roadbed of the railway—and from this came the great silver mines of Cobalt. It was the wealth which came from this mining camp which assisted the development of the Porcupine district in Northern Ontario. And it was from Porcupine that prospectors branched out into northwestern Quebec where today, twenty-five years later, mining is expanding rapidly.

Thus, the Canadian Shield which once separated Canada into isolated communities, seeming to hold these communities forever apart by its untamed ruggedness, is today a major factor in the sequence of events which has brought Canada to a leading place among the world of nations, promising a future of

Panoramic view of Cobalt on Lake Cobalt, Temiskaming, centre of one of the richest silver mining districts in the world. The region also produces cobalt, arsenic, nickel and copper.

A. MacLean. Haileybury, Ontario

Kirkland Lake, for many years symbolical of Ontario's mining regions, presents in this one photograph a view of no less than seven head-frames.

Canadian Metal Mining Assoc.

Flying over the vast expanses of the Canadian Shield, an air passenger may come on a sight like this view of Central Patricia in Northwestern Ontario—a mining town springing up in the wilderness hundreds of miles from civilization. In front of the mine head-frame is a new development of miners' homes.

Despite isolation by road or rail, miners' homes have all modern conveniences. All material for these particular homes was either flown in or brought in over a 250-mile chain of waterways and portages.

industrial and economic strength. Although this Shield produced in 1948 almost half of Canada's $802,000,000 worth of minerals, its significance goes far beyond the value of its mineral wealth. In its primitive state the Shield offered a challenge to Canadians. The fact that the miner, the railroad man, the woodsman, the trapper, the farmer, the engineer and the merchant took up that challenge and met it successfully has rewarded Canada with tremendous advantages which are felt in every home. Nor has the Shield yet yielded up its full measure of usefulness to Canada and Canadians. The successes of the past fifty years are merely indications of the progress that may be made in this land in the next half century and in the centuries to come.

This hotel at Pickle Crow represents the up-to-date accommodation prevailing in mining communities today.

As mines prosper, communities grow around them, as shown in this recent picture of Virginiatown in the Timiskaming district of Northern Ontario.

Canadian Metal Mining Assoc. photographs

Many countries depend largely for their daily bread on Canada's wheat. Although most of the crop is gro on the prairies, the productive zone is being extended northwards. Good crops have been grown in north British Columbia, and vegetable crops and cereal grains have been successfully grown in the Yukon. T photograph was taken at a northerly Dominion Experimental Station where wheat is flourishing in shadow of the Rockies.

The World Food Supply

by G. S. H. BARTON

IN THE PAST in most countries people have been able to take their food supply for granted. It has now become a many-sided problem for all people, in fact a series of problems. During the war most people became food conscious and since the war they have become aware that food supply can be a problem. Food has always assumed some importance during war, primarily because of the needs of the Armed Forces. In history it has been a predisposing cause of war. In modern times, with the urge for better living and the struggle to obtain it, it has become a potential agency for promoting war. Herbert Hoover is reported to have said in World War I, "without the loaf you could not preserve public tranquility".

In World War I, a period of comparative plenty, food supply did not enter directly into war preparations but it soon became a strategic consideration and in the end a telling factor in the defeat of Germany.

Before World War II, a period of abundance, food supply was a matter for carefully calculated measures and strategy by those who made the greatest preparations. During the war it emerged as a top priority assignment in all countries. Following World War II, because of the widespread devastation in many countries, the disruption of production and the destruction of transportation and other facilities, it became the most serious problem, and it continued from crisis to crisis until a few months ago when, thanks largely to a bounteous nature, a reasonable approach to pre-war consumption of maintenance food became possible.

The Post-war Food Situation

While the war and its effects have revealed that food supply can be a serious problem, there is danger that as more countries become blessed with plenty the world food

problem may be pushed into the background by those who could do most about it. The acute conditions experienced, however, have stirred many people to probe beyond the immediate future and to try to enlighten the world as to further disaster that may lie ahead.

The first international approach to the post-war problem was made in May, 1943, at Hot Springs when President Roosevelt called a conference of the Allied Nations to examine it. At that conference the problem was considered on a period basis — the immediate post-war period, the transition period, and the peace-time period — but it was impossible to be very precise as to the duration of any one of these periods. That approach, however, did envisage progressive plans and action in accordance with developments. Appropriate recommendations were made to all the governments represented concerning steps that should be taken and the general pattern of food production considered at that time to be desirable.

Last year, perhaps, marked development of the transition period. It is true that at present many people in many lands are far from being properly fed. But, as a result of the harvests in 1948, for the first time since the war essential basic foods for human consumption are in sufficient supply to permit the removal of some of the most serious restrictions. Among these basic foods may be mentioned bread grains, rice, wheat and rye, sugar, oils and fats, and among the restrictions removed in most countries are extraction requirements and bread rationing. Despite this relief there are still grave problems of distribution.

Looking at the near future prospects it must be remembered that while not all of the food in the world will be consumed before this year's harvests are garnered, the residue will not be large; world stocks will be at a low point. A considerable number of countries will soon have been completely rehabilitated for food production, but 1948 production conditions, when the total yields approximated pre-war, were well above the average and cannot be expected to continue from year to year. There are more people to feed than before the war in all countries, and further increased populations are to be expected in countries with the highest living standards as well as in those with the lowest.

The wheat surplus areas are largely in the New World — North America, Argentina and Australia. Climatic conditions in all these areas are subject to violent fluctuations. It was fortunate for the world that during and since the war continuous production in the United States and Canada yielded such large supplies.

Food supply cannot be divorced from world economy. In the immediate post-war period a number of countries purchased food as a first charge against what financial reserves they had. Loans and gifts were made to countries in need for the purchase of food and for rehabilitation purposes. Countries without reserves were provided for through UNRRA. By 1948 all this provision had become pretty well exhausted and many countries found themselves without the necessary financial resources to purchase either food or rehabilitation requirements in the countries that could supply them. What had been a food crisis now became a dollar crisis as well.

Then came the Marshall Plan to provide the means for continued purchase of food and other supplies and the economic recovery of Europe. All expenditure under the Marshall Plan is subject to certain conditions and authorized by the United States. Fortunately for Canada, no longer able to extend purchasing power to other countries, the Marshall Plan provided for what are called "offshore purchases" of products which may not be available in the United States or which are not declared surplus in that country. In 1948 all the more important food commodities which Canada had to export moved to other countries that wanted to import them. The dollar crisis, however, is not completely solved by the Marshall Plan and no one seems able to tell how long it may persist.

In the meantime the major importing countries find it necessary to curtail their imports from countries such as Canada where dollars are required for purchase and to

extend their purchases in non-dollar countries. One effect of the conditions imposed under the Marshall Plan is that the country able to provide funds for the purchase of its products by other countries is in a position of priority for the distribution of its own products. This may seriously affect both production and distribution in competitive countries not so situated. Production for export may take place in any country without previous assurance of markets but it cannot be encouraged or expected in products for which access to other countries is controlled by the supplies of similar local products. With any accumulation or extension of such impediments the net result in a country like Canada, whose products may be so affected, may well be that neither full production nor complete distribution can be contemplated. It is believed that through improved economy in countries which must depend on outside sources for substantial food supplies and through international trade which is being developed in a wide range of products, the purchasing power to obtain food supplies from any source that may be mutually beneficial to the countries concerned will be re-established.

It should also be understood that countries which have suffered most through food shortage are planning and striving to increase production within their own boundaries. They are now seized with the urgency of doing this as never before. Through international association brought about by the war, and since the war through the United Nations (particularly the Food and Agriculture Organization), countries that have been backward in modern developments have become impressed with what is being done in other lands and what might be done in their own, and they are becoming more and more familiar with modern methods and practices. The advantages of mechanization, the effective use of fertilizers, improved varieties of plants, plant disease resistance, plant protection measures and food preservation methods are all being recognized, and efforts are being made to employ these means of increasing food supply. Such development is largely dependent upon trained personnel, and this is another limiting factor that will take time to overcome. New land resources will probably be added to the production areas but most countries with food deficits have already utilized the great bulk of their lands, some of which have become depleted or exhausted.

Because of economic conditions there may be both shortages and surpluses. Under such conditions it is extremely difficult for some exporting countries to relate production programs to consumption requirements. It would appear, therefore, that even for the next few years the food supply necessary for reasonable maintenance is not without hazards. In what remains of the transition period perhaps the best that can be said of the prospect for food supplies is that the world can be fed.

World Population and Food Supply

On the horizon of the more distant future we can see the imponderables, among them, standing out in bold relief, a rising tide of world population. In the introduction to the recent book, *Road to Survival* by Vogt, Bernard M. Baruch said, "It asks more questions than it answers, as any scientific book must," and the author himself in the foreword stated, "What we believe today to be a fact may tomorrow become an illusion".

A century and a half ago Malthus, an English clergyman-economist, expounded the theory that population tended to increase more rapidly than the means of subsistence. Developments in food production and the addition to the cultivated areas of vast agricultural lands in the New World discredited the theory. Nevertheless, the spectre of want has emerged during that period and is with us today.

Fifty years ago the President of the British Association for the Advancement of Science, Sir William Crookes, saw chemistry as the solution to what he called "the deadly peril of not having enough to eat". In 1948 Sir Henry Tizard, the present President, said, "We must not encourage the easy thought that some entirely new development in science will solve the food problem quickly.

The population of the world as a whole is now increasing one per cent a year and its distribution is such as to make it extremely doubtful whether the supply of food can keep pace, even with the present low standard of nutrition." Julian Huxley, British scientist and recently retired Director-General of UNESCO, "sees the world's population increase as a greater threat to our civilization than war; the final and inescapable fact is that resources are limited in the last resort by the space of the world's surface". At Cheltenham, England, the first International Congress on Population and World Resources in Relation to Family was attended by three hundred physicians, sociologists and educators from thirty nations. Its stated purpose was "to seek an alternative method of population control to nature's old standbys of war, famine and epidemic, and to help restore a balance between people and resources".

Complete population statistics are not available because authentic data cannot be obtained for all areas. Percentage increases are given by F.A.O. from the base period of 1934-38 to 1947 as follows:

POPULATION OF THE WORLD:
PROVISIONAL ESTIMATES FOR 1934-38 AND 1947

Area	1934-38	1947	Percentage Increase[1]
	(...Millions...)		(Percentage)
Far East (excl. post-war area of U.S.S.R.)	1,066	1,162	9.2
Europe (excl. post-war area of U.S.S.R.)	370	383	3.5
North America	139	157	12.6
Central and South America[2]	123	153	24.0
Oceania	10	12	14.8
Africa	121	140	11.4
Near East	106	119	11.2
U.S.S.R. (post-war area)	[3]186	[3]195	[3]10.5
WORLD TOTAL OR AVERAGE (incl. all areas)	[3]2,120	[3]2,320	[3]9.4

[1] Percentages computed before rounding.

[2] Includes Mexico.

[3] F.A.O. estimates; the other figures are based mainly on data furnished by the Statistical Office of the United Nations.

With overall food production in 1948 approximately equal to pre-war this means that supplies per person must be relatively less.

How far this widespread upsurge of population may go no one can determine. Dr. H. R. Tolley, Director of Economics and Statistics in F.A.O., at a meeting of the American Association for the Advancement of Science in December, 1946, stated: "In much of what is referred to as the Western World, constituting one-fifth of the world's people, relative stability or actual decline in population may occur within a generation. In another fifth, made up of the Soviet Union, Japan, Eastern and Southern Europe, and parts of Latin America, increases will occur for at least a generation or two. Thus in areas representing forty per cent of the world's population, areas in which industrialization has made greatest progress, population growth may have ceased by the end of this century." In the other areas of Asia and Africa, which contain the other three-fifths of the world, while epidemics and famine have decreased population, fertility would not appear to have been affected. With the minimizing of epidemics and famine and in the absence of other direct means of adjusting population growth, there remains the possibility or probability that with the growing urge among such populations for better living, countries in these areas will gradually tend toward the stabilization or decline pattern of Western civilization through reduction in births.

This brings us to the question: given peace conditions, can sufficient food be produced to sustain the further substantially increased populations envisaged in the long run period? There are those who hold out the possibility that the answer may be found by modern science without relation to soil resources upon which the world has so far depended for sustenance. They point out that plants can be grown in chemically charged water, that edible fats have been synthesized from brown coal, that nutrition can be supplied in synthetic tablet form, and, of course, that atomic energy may change the world completely. In reference to some

such developments, Vogt says, "The bare possibility of such developments certainly lies many decades in the future, and it is literally true that we do not have time to wait for them." F.A.O. states that to provide food sufficient to maintain health standards for the estimated world population in 1960 will require an overall increase in food production, based upon pre-war levels, of twenty-five per cent.

No one would discount what science may do in the next ten years. Great as its contributions have been in supplying synthetic forms of human nutrition, they do not compare with its contributions in the organic form through the medium of soils and plants, and there is a lot less speculation in looking to this source to attain the needed increased food supply, at least in the near future. One noted authority, Robert M. Salter, Chief, Bureau of Plant Industry, Soils and Engineering in the U.S.D.A.,* has put forward the claim that the F.A.O. objective can be reached by improving production through greater application of present knowledge and experience and by supplementing the present productive area through the addition of substantial areas of podsol soils in the north temperate zone and red soils in the tropics and subtropics. Canada has large areas of the so-called podsols yet to be developed.

How Much Farming Land?

We have now come to the second imponderable on the horizon. It appears as a very irregular outline of the world's land resources. Food production potentialities of much of the world's land surface have not been completely determined. The arable area is given as 4,000,000,000 acres by the U.S.D.A., about eight per cent of the earth's surface. Some authorities put the production area at considerably less. Canada's proportion of land improved for farming is about eight per cent. Europe has forty per cent of its land under crop.

On the basis of the U.S.D.A. figure and a present world population of 2,200,000,000 the per capita land area would be less than two acres, some of which would not be very productive. The United States has 3.5 acres per capita of improved land and Canada has 7 acres per capita but only part of such land is now under crop.

It happens that nearly eight per cent of the earth's surface is under forest. Only about two-thirds of the world's so-called forested area is classed as productive, the balance being scrub or tundra and only about fifty per cent of the productive forest is accessible and in use. Large areas of the world's surface are too wet to produce crops for food, others are too dry, others are too cold, and still others are too poor and rough. There are no longer broad, level, treeless plains of productive land occupied by wild animals. Viewed as a whole, therefore, the earth does not appear to be a planet with unlimited food production resources.

In some of the larger unproductive areas limited parts no doubt can be adapted to the production of specialized products. The utilization of certain productive forested land and other vegetation areas within the productive zone appears to offer the only hope of providing substantial acreage increase to the present four billion acres now in use. It is to be expected, therefore, that additions from such lands will continue to be gradually brought into food production.

Much of Canada's agricultural land was cleared of primeval forest largely by hand labour. Today new settlers, including ex-service men, are extending the northern boundaries of our productive land in the wooded areas. There is some conflict of view as to the practicability of rapidly converting large areas of unimproved land to food production purposes. There are, however, some important development projects now under way by governments in Africa and elsewhere. Large expenditures are involved. It may be that F.A.O. can bring about the development of other similar projects, or it may be that an emergency will have to develop to persuade more people to do that kind of work and to justify national and perhaps international action in organizing and financing it on a large scale. We can be reasonably sure that it will not be done by individual enterprise. Meanwhile

*United States Department of Agriculture.

uncertainty as to international distribution is a deterrent to such development.

Soil Conservation Urgently Needed

Another aspect of land resources which is not receiving the attention it requires in the great majority of countries is the increasing wastage of land that has been productive, because of the depletion of soil fertility and the actual loss of the soil itself. It has often been said that the top six inches of soil is the greatest source of wealth and human well-being.

Sir John Boyd Orr as Director-General of F.A.O., in the Foreword to a publication by F.A.O. entitled "Soil Conservation", wrote: "If the soil on which all agriculture and all human life depends, is wasted away by erosion, then the battle to free humankind from want is certainly lost. Soil washed away, soil blown away, fertile soil covered up with sterile soil, all are lost to human usefulness in our time. The attrition is constant, the loss is with us every day, and this at the very time when the war against want is being waged most hotly." The need for soil conservation is world wide. It is not a new development. It began in the oldest countries with the pressure of population on natural resources and it has continued in many of those countries with increasing intensity to the present time. Failure to cope with it has brought disaster after disaster to many of the oldest lands. In the New World, also, soil erosion spells disaster. We in Canada know what the "Dust Bowl" means: that is the result of soil erosion by wind. We know the havoc of floods and we have seen the deposits of soil that are carried by them; that is soil erosion by water. Similar conditions obtain in the United States, in Australia, New Zealand, and in South America. The development of soil erosion in the New World has not been brought about by the pressure of population for existence. It is the result of rapid exploitation of natural resources and the abuse of land, both of which have been ignorantly extolled as inexhaustible.

The urgency of the need for soil conservation is now upon the world, and F.A.O. is doing what it can to impress the world with that urgency and to co-operate with countries that need the kind of assistance that F.A.O. can give in meeting it. The older countries, through experience, have developed farm practices and other methods of control which they continue to apply, but in many of them the means are not adequate to attain the ends. The United States, perhaps because of its larger population, its earlier exploitation and the wealth derived from it, has taken the lead in conservation work in the New World. Canada, impelled by the devastating dust storms of the drought period, inaugurated a program of rehabilitation for the prairies in 1935; its objectives are the conservation of water and control of its distribution, the judicious use of soil, and its protection against wind. In forestry, also, measures are being taken for protection against fire hazards, destruction by insects and disease, and for redevelopment in some harvested areas.

Nature's balance of trees, vegetation in other forms, natural reservoirs, and wild animals would not have allowed such enormous destruction by erosion. Man has been the most destructive animal of them all. Nothing short of complete mobilization and employment of farm, forest, and river forces on all world fronts will win the battle against erosion and preserve the earth's productive soils. It calls for consideration and action by the United Nations as well as at the national level.

Soil depletion is related to soil erosion but it derives directly from bad farming. Science and technology and experience have already provided many of the answers to this but here again exploitation, and with it economic factors, systems of land tenure, ignorance, and apathy have all been contributing factors against their application. The restoration of soil fertility, in large measure if not completely, is not beyond the bounds of practicability.

There are those who hold the view that since a large proportion of the improved land now available is not under crop the crop land area could be greatly expanded without risks of soil exhaustion. Scientists

and technologists are confident that through their services and in the application of what they have to offer, production yields can be greatly increased. Dr. Kellog, Chief of the Division of Soil Survey, U.S.D.A., in answer to the question of the ability of the world to feed its people, said, "Yes, the soil resources exist and the technical knowledge exists to give us food far above our present requirements. How far it is difficult to say, but certainly a long way." Under the stimulus of war the United States and Canada increased their production by thirty per cent and the United Kingdom even more. This was not done without the help of a kind providence. Nor was it done without the loss of fertility and changes in the utilization of land for the production of maintenance foods of high war priority. World-wide developments of the kind indicated would involve what may prove to be insuperable difficulties in human adjustment, and in freedom loving countries would be contingent upon economic incentive.

In addition to the deplorable waste of soil and its fertility there is the even more deplorable waste of food. F.A.O. reports that losses in bread grains alone amount to over thirty million tons per annum. The total exportable world surplus of such grains from the 1947 crops did not greatly exceed the estimated total waste. For waste of this magnitude people ranging all the way from farmers to housewives, including those engaged in storage, transportation, milling and baking, with the assistance of rats and insects, must be held responsible. The difficulty of eliminating it was apparent in its persistence in countries of plenty during the war, despite active measures to curtail it and widespread campaigns to make people waste conscious.

Fish Are Important

On the horizon there remains one other great source of human food supply, perhaps only indirectly related to soil resources, the fish of the sea and fresh waters. In the report of a technical committee under the International Interim Commission of which our present Minister of External Affairs, Honourable L. B. Pearson, was Chairman, and through which F.A.O. was established in 1945, it is pointed out that from ancient times man has recognized the food value of fish, that measured by the labour involved fish are among the least costly of all protein foods, and that the world production of fish was then estimated at 39,000 million pounds. The fish industry, like other food industries and the soil from which they are derived, has not been without waste and exhaustive exploitation, and, while the Committee observed that, "contrary to popular belief the sea is not full of fish", it did state that there are substantial underdeveloped fishing resources and many potentially profitable supplies totally unused by man. In reviewing the possibilities for expanding world production and use of fish the Committee emphasizes more "intensive prosecution of existing fisheries, greater utilization of the catch and greater exploitation of little developed fisheries". Canada's Deputy Minister of Fisheries advises that "the fish food supplies in the world, taking all species into account, could be increased several times beyond present amounts in emergency, or if there was greater utilization of the catch".

In this perspective which I have tried to sketch it will be apparent that the world food supply is a many-sided problem, and that while looming on the horizon there are great requirements, there are also great potential resources. It will also be apparent that with the obstacles which appear in the foreground the world will not be fed without a struggle.

BIRD SERIES — Part IV

Photographs and Notes by W. V. CRICH

YELLOW-BILLED CUCKOO *COCCYZUS AMERICANUS AMERICANUS*

THERE are two species of the cuckoo family in Ontario. These are the Black-billed and the Yellow-billed Cuckoos, but the black-bill is much more frequently found and better known in southern Ontario. The yellow-bill is more common than the black-bill in the southern United States.

The cuckoo is a rather shy and retiring bird, keeping quietly among the foliage of bushes and trees. It is a woodland bird, but like so many other species, it does not entirely avoid orchards and parks in close proximity to the abode of man.

Although quiet most of the time, on very hot mornings during the middle of the summer, it utters its familiar and unmusical *kow-kow*. This call is said to presage rain, and for this reason, in some localities, it is called a "rain crow".

The adult in the accompanying photograph was found nesting in a lilac tree about twenty feet from a market-gardener's home. Here it was unmolested, for the market-gardener understood the value of birds to his economy. It, in turn, found an abundant food supply around the shade trees in the orchard and around the garden.

Ornithologists have observed that cuckoos feed largely on caterpillars, and this has been confirmed by an analysis of their stomach contents. They appear to prefer the hairy and spiny species, which are not taken by other birds. The extent to which cuckoos eat hairy caterpillars is shown by examining the lining of their stomachs, which quite often are so pierced by these hairs that they appear to be completely furred. As these birds live in the shade among the leaves of trees and bushes, it is surprising to find that grasshoppers are the second largest item of diet. Grasshoppers' favourite haunts are on the ground in the blazing sun, but they seem to be such an agreeable food for birds that many birds forsake their natural habitat for these luscious morsels. This might be called "dining out". In any case, such a diet (of caterpillars and grasshoppers) makes the Yellow-billed Cuckoo a valuable ally of the agriculturist. It has no objectionable habits and it destroys many insect pests.

The European cuckoo is a parasite and neither builds its own nest nor rears its young. This is not the case with the American cuckoos. Although they are very poor nest-builders and even get so careless sometimes that they lay in each others' nests, they at least look after their own progeny. The nest pictured with the two eggs was found about two feet above the ground in a virginia creeper; it was merely a shallow platform composed of small sticks and stems, so loosely constructed that the sky could be seen through it. In spite of its slovenly appearance, one had to admire its downy interior which had a lining made up of catkins from the Balm of Gilead tree, and on this reposed two very pale, glaucous, green eggs. Low nesting appears to be a characteristic of this bird. The eggs are generally laid during May or June in the Toronto district, and vary in number from one to as many as eight. This larger number may be the product of more than one female.

The Yellow-billed Cuckoo is recognized in the field by several markings. A long, slender, graceful shape, brownish above and whitish below, distinguishes it as a cuckoo. If the opportunity for close observation exists, the bill should be studied. It is down-curved, and the under mandible, with the exception of the very tip, is yellow, the same colour showing at the base of the upper mandible. This feature can be clearly seen in the photograph. When the bird flies, the spread wings show reddish brown. The tail is quite long, and if viewed from the under side, it is found to have large white spots. This, with the yellow lower mandible, distinguishes it from the Black-billed Cuckoo.

Both adults help to incubate the eggs, which takes about fourteen days. The young are quite active and defend themselves by a hissing sound very similar to that emitted by a number of bees, and by vigorous stabs with their beaks. The nestlings are repulsive creatures which look like young porcupines. The body is covered with long, white feather-sheaths until the young are nearly half-grown: then the sheaths burst and the bird is well feathered. The remains of the feather-sheaths are to be found afterwards in the bottom of the nest. The first plumage is very similar to that of the adult cuckoo, with the exception of the tail, which is entirely different; the conspicuous black markings and white spots on the under side are subdued to grayish-black and grayish-white.

The Yellow-billed Cuckoo's range extends from New Brunswick and southern Ontario as far south as the Gulf of Mexico. It spends the winter in South America.

Official U.N. Photograph

The International Control of Atomic Energy

by A. G. L. McNAUGHTON

ONE OF THE IMPORTANT ACTS of the first session of the General Assembly of the United Nations which met in London in January 1946 was to establish a commission to study and make proposals for the international control of atomic energy. This commission first met in New York in June of the same year. During the following two years (up to June 1948), in the course of some 240 meetings, it produced three reports.

In all, seventeen nations have served on the commission for various periods and of these, fourteen, including Canada, are in agreement as to the general nature of the system of control required. The other three, which are the U.S.S.R. and the Soviet-dominated states of Poland and the Ukraine, hold different views. The plan of the majority provides for the creation of an international atomic authority which would own in trust for the nations of the world all uranium and thorium after they are taken

General McNaughton presiding over a meeting of the Security Council at Lake Success in January 1949. At his right is Mr. Trygve Lie, Secretary General of the United Nations. Presidency of the Council rotates among different nations each month.

from the ground. This authority would control the extent of the mining of these ores which are the only known materials from which energy can be released in substantial amounts by the fission of the atom. Production would be strictly related to consumption and there would be no accumulated stocks to cause anxiety.

The authority would own, operate, and manage all facilities handling dangerous amounts of fissionable material. It would conduct research in the field of atomic energy, except that research requiring non-dangerous quantities only would be freely licensed with provision for full publication of findings.

The authority would administer the quotas of atomic energy materials, facilities or power allocated to each nation in accordance with the proposed atomic energy treaty and would build and operate plants within the nation's quota. No nation would be permitted to possess dangerous quantities of atomic fuels or to own plants for making them. Atomic weapons would be prohibited. The authority would be empowered to ascertain resources and to prevent secret activities.

It is the view of the majority that only with such a system operating satisfactorily would countries possessing atomic weapons be justified in disposing of their stocks of bombs and facilities for making them and giving to the world their secrets for the production of atomic energy. These nations feel that the only way by which security can be given to the world lies in the complete elimination of secrecy in atomic matters together with the institution of international inspection and control on such a comprehensive basis that it will provide adequate and acceptable safeguards against all possibility of the hazards of violations and evasions.

The majority of the members of the commission are convinced not only that the system they have proposed will give the safeguards needed but that it is the only method by which this desired end can be achieved.

On the other hand the Soviets have put forward a plan which differs fundamentally. They have proposed the immediate outlawing of the atomic bomb and the destruction of existing stocks. Following this the Soviets concede the need for instituting what they call "strict international control" but their proposals in this connection on detailed examination have been shown to be merely a system of periodic visits to plants whose existence would have been declared by their government if they had seen fit. There was also to be "special" inspection on suspicion, but any method of gaining information on which suspicion might be based was carefully excluded.

The commission's examination of these proposals showed that they would represent only an act of unilateral disarmament by the United States which, even if it were carried out, would give no assurance that any country engaged in atomic activities would not or could not secretly make and use the bomb in future.

This follows from the fact that the fissionable materials which are the essential substances for such peaceful applications of atomic energy as the future development of atomic power are also the explosive element of the bomb. In the absence of effective inspection and control these substances could readily be diverted clandestinely from peaceful to military use by a nation secretly preparing atomic war.

The majority were therefore forced to the conclusion, despite every wish to find a basis of agreement, that they must reject the Soviet proposals as "completely ignoring the existing technical knowledge of the problem or providing an adequate basis for effective international control and the elimination of atomic weapons from national armaments".

Such was the situation in the Atomic Energy Commission in the spring of 1948. The Soviets were adamant against the acceptance of the elements of control which the majority were convinced were necessary and, having regard to the far reaching consequences of any doubt on these matters, the majority could accept nothing less.

As a consequence it became evident that the issue should be raised for clarification in the broader forum presented by the third session of the General Assembly then due to meet in Paris in September.

In proposing that the Security Council should be invited to accept this course, the majority members of the commission after reaffirming the correctness of their proposals, pointed out that having concluded that part of their task concerned primarily with scientific and technological matters, they realized that the time had arrived when increased efforts should be made with regard to general considerations, including those of an international political character, the debate on which could be pressed with greater advantage in the General Assembly of the United Nations itself.

The attempt to solve the atomic energy *impasse* in the Security Council met, on 22 June 1948, with the twenty-sixth veto exercised by the Soviet Union. However, a procedural motion to refer the three reports of the commission to the General Assembly "as a matter of special concern" was passed by a majority of nine to two.

There was thus created an opportunity to test the conclusions of the majority both as regards their technical correctness and also, and most importantly, as to their acceptability to the member nations of the General Assembly.

Further development of these matters took place in Paris during September, October and November last. In the opening meetings of the General Assembly the Atomic Energy Commission's proposals were given wide support and the urgency of establishing effective control was expressed by many nations. The exceptions were the Soviet Union and its satellites whose delegates reiterated their insistence on "prohibition" of atomic weapons and the destruction of existing stocks.

To this end the Soviet raised two separate sets of proposals. In the one the prohibition of atomic weapons was combined with a project for an immediate arbitrary reduction of one-third in the conventional armaments of the five permanent members of the Security Council. The discussion of this proposal was principally related to conventional armaments and in the end the fallacies of this approach were fully exposed.

The other Soviet proposal introduced the idea of "simultaneous" conventions, the one for the prohibition of atomic weapons and the other for what the Soviet described as "effective international control". Both conventions were to be signed to "enter into force and actual operation simultaneously."

Formerly the Soviet had insisted on prohibition and destruction of existing stocks as a first step. Now they claimed that in their new proposals they had made a great concession to promote agreement.

There is no doubt that, for a time, this new Soviet insistence on the word "simultaneous" confused the issue and raised false hopes in the minds of some of those who were anxiously concerned about the future. However, in the discussion it soon became evident that the Soviet ideas on what would constitute effective international control had not advanced at all from their previous scheme which had already been subjected to the most meticulous examination and rejected by the commission as fundamentally inadequate.

It did not add in the least to the safety of the world to have "simultaneous" control when the elements of that control would lack the character deemed necessary to provide acceptable safeguards which would dispel suspicion and promote co-operation between nations. I can only describe the Soviet proposal as specious. It was so recognized by a great majority in the General Assembly and decisively rejected. No nation outside the Soviet group voted for it.

The draft resolution put forward by Canada became the framework of the debate and after development in the Political Committee it provided that the Assembly should endorse the relevant portions of the majority proposals of the Atomic Energy Commission "as constituting the necessary basis" of an effective system of international

control which would give adequate protection against the hazards of violations and evasions.

The Canadian resolution recognized the practical situation caused by the flat rejection of the commission's proposals by the Soviet and its consequent inability to make progress in the technical matters within its competence until this impasse had been resolved. It recognized that these difficulties were largely political and it therefore provided a political method of endeavour to reconcile the dispute. This was that the six original sponsors should "meet together and consult in order to determine if there exists a basis for agreement on the international control of atomic energy". It was proposed that this meeting should take place on "a high level" to determine a basis on which the commission's work could be resumed.

A number of delegations reminded the General Assembly that the Atomic Energy Commission was not subject to the "veto" and suggested therefore that it should resume its work, ride over any Soviet objections and prepare a Treaty. On the other hand, most delegations supported the view that such action would be unwise at this time as this procedure would result in accentuating and hardening the divisions of opinion between the Soviet and the rest of the world.

However, as the debate developed it became evident that a considerable number of delegations, while not subscribing to the view that the commission should override the Soviet nations on the clauses of the Treaty, nevertheless felt that it would be well for the world if the Atomic Energy Commission remained in session so as to keep the whole of this dangerous situation under constant review. It was thought that if this were done the commission might even be able to make progress on some aspects of its technical work.

The Canadian Delegation and those who had joined in the sponsorship of its resolution, particularly the United States and France, were happy to accede to this more hopeful view of the possibilities of progress. The proposal was therefore modified so as to provide that the commission would resume its meetings and "proceed to the further study of such of the subjects remaining in its program of work as it considers to be practicable and useful".

In this form the resolution went to a plenary session of the General Assembly where it received forty votes in favour to six against. Those against included the Soviet and Soviet satellites only. The twelve nations unaccounted for or abstaining include a number who have not yet made up their minds on this complex and difficult subject. A few made reservations because of special interest in uranium and thorium ores and unfortunately a number were absent because the vote came earlier than had been expected. Altogether it is thought that in one form or another some forty-six nations expressed in Paris their acceptance, at least in principle, of the majority proposals.

Thus I can say that the novel and far reaching project for the international control of atomic energy which has been evolved by the United Nations Atomic Energy Commission has met with acceptance by the great majority of the nations and we can feel therefore that this project commends itself to the conscience and reason of the world.

This is most important for the future because it is the assurance which was sought when the Canadian delegation took this great question to the General Assembly in Paris. It has been given in generous measure and even the Soviet must now realize that they stand almost in isolation in their failure to accept the new conceptions of international organization which seem to be an inescapable condition for the survival of civilization in this atomic age.

We may hope that by continued, patient and persistent efforts in the commission and through the meetings of the "six" sponsors to be held later in the year, we will yet be able to carry conviction to the peoples of the Soviet. There is a little time left which can safely be given to this process of education and appreciation and it must be used to the best advantage.

EDITOR'S NOTE-BOOK

B. J. McGuire and H. E. Freeman worked together for the first time in 1935-36 when Mr. McGuire was the editor-in-chief of the University of Toronto daily publication, *The Varsity*, and Mr. Freeman was a news writer on that paper. After graduation Mr. Freeman joined the staff of The Canadian Press and during the next nine years worked as editor in bureaux from Sydney to Winnipeg with wartime excursions as a reporter with the R.C.N. on convoys and with R.A.F. Transport Command in the Middle East. Mr. McGuire continued in newspaper work for some time after graduation, then joined the staff of The Aluminum Company of Canada, Ltd., and spent the next several years in public and industrial relations work with that company in Toronto, Kingston and Montreal. They came together again in 1945 with Public and Industrial Relations Limited where Mr. Freeman is now manager of the News Bureau and Mr. McGuire is a director. Much of their present writing is of an educational nature.

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G. S. H. Barton, C.M.G., is Special Assistant to the Dominion Minister of Agriculture and Canadian Delegate to the Food and Agriculture Organization of the United Nations. Dr. Barton was born in Ontario. He graduated from the Ontario Agricultural College with the degree of B.S.A. from the University of Toronto. For seven years he was Dean of the Faculty of Agriculture of McGill University, and for the following sixteen years he was Deputy Minister of the Dominion Department of Agriculture. Dr. Barton has published many articles on agricultural subjects; the article on the world food supply in this issue is based upon an address given by Dr. Barton to the Ottawa Branch of the United Nations Association earlier this year.

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A. G. L. McNaughton, C.H., C.B., C.M.G., D.S.O. is Canadian Permanent Delegate to the United Nations. In September 1945 General McNaughton was appointed Chairman of the Canadian-American Joint Defence Board and in April 1946 Canadian Representative to the United Nations Atomic Energy Commission. In September 1946 he became president of the Atomic Energy Control Board of Canada. Born in Saskatchewan, General McNaughton was educated at public school, Moosomin, Bishop's College School, Lennoxville, Quebec, and McGill University. Having been granted the degree of M.Sc., General McNaughton turned to a military career and distinguished himself not only in the army but in the fields of electrical engineering and research. Prior to World War II he was for some years President of the National Research Council, in which capacity he made a valuable contribution to Canada's scientific progress. On the outbreak of war he returned to active service and commanded the First Canadian Army Overseas. In 1944 indifferent health led to his retirement from the army; he was given the rank of full General in recognition of his outstanding service to Canada. Later in the year General McNaughton was appointed Minister of National Defence.

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AMONGST THE NEW BOOKS

Canada 1949

(King's Printer, Ottawa, 25 cents)

This handbook of Canada becomes more attractive year by year. One starts to look up some statistical point and becomes absorbed in the excellent photographs that so generously adorn the book. One picture leads to another and, having checked the quantity of fish landed in Canada as one set out to do, one finds before putting the book down that one has learnt a considerable amount about such things as agricultural production, housing developments, paper making, mines, furs, and forestry—all in the most agreeable way. In addition to the black and white illustrations there are a map and several coloured reproductions, the frontispiece being a tribute to Newfoundland. For those who do not require the detailed data contained in the *Canada Year Book*, the handbook furnishes a brief record of current conditions with accurate statistics covering general requirements. Published by the authority of the Minister of Trade and Commerce, the moderate price of this book is no indication of its value. It is the best quarter's-worth that I know.

M. B.